LiMPETS

Long-term Monitoring Program and Experiential Training for Students

<> Training in scientific monitoring activities for teachers and students

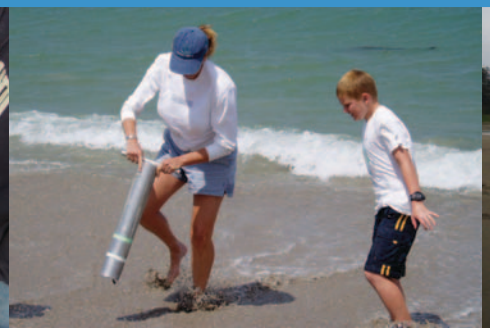
<> Collecting reliable and valid data through established protocols

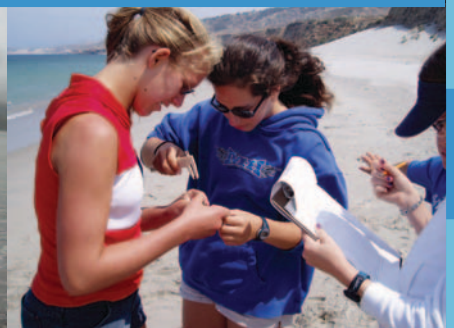
<> Contributing data that will assist resource managers in making informed decisions about America's ocean treasures

National Marine Sanctuaries

NOAA Ocean Service

NOAA' s National Marine Sanctuary Program Education Mission: To promote public understanding of our National Marine Sanctuaries and to empower citizens with the necessary knowledge to make informed decisions that lead to the responsible stewardship of aquatic ecosystems.





Students explore the sandy beach enviornment by monitoring for sand crabs (*Emerita analoga*). Claire Johnson/NOAA

Teachers pratice rocky intertidal protocols using the classroom field kit during the West Coast LiMPETS Workshop. Kathy deWet Oleson/NOAA

INTRODUCTION

The Long-term Monitoring Program and Experiential Training for Students, also known as LiMPETS, provides a unique opportunity for teachers to participate in professional development to gain the necessary skills and confidence to engage their students in monitoring activities in the field. This hands-on program has been developed for middle and high school students, as well as other volunteer groups to monitor ocean and coastal ecosystems of the five west coast National Marine Sanctuaries – Olympic Coast, Cordell Bank, Gulf of the Farallones, Monterey Bay and Channel Islands.

The intertidal and offshore habitats of the west coast National Marine Sanctuaries are among the most diverse and productive of any region in the world. Despite their ecological significance and protected status, these habitats, along with sandy beaches, are being increasingly impacted by human activities (directly by harvesting and trampling, indirectly through pollution and litter). In addition, there are dramatic geological and climatic disruptions along sanctuary shores (earthquakes, severe storms, El Niño events, global warming) that could generate change in the biota. Awareness by the local communities of these phenomena and how they influence these habitats and their inhabitants is vital if these ecosystems are to continue receiving the protection they deserve.

Though the LiMPETS network will include monitoring of a variety of measures in ocean and coastal ecosystems, the National Marine Sanctuary Program and its partners have currently established rigorous guidelines to monitor the abundance and distribution of rocky intertidal biota and sand crabs, as well as developed offshore monitoring activities to increase awareness and stewardship of these important ecosystems.

Standardized protocols to monitor rocky intertidal, sandy beach and offshore areas are being used by numerous school groups currently, and we hope to engage even more in the future. These protocols for monitoring activities, along with species lists, and other pertinent information that aid educators in incorporating hands-on monitoring activities in the field are available on a robust web site (http://limpets.noaa.gov). Several areas have been selected within each sanctuary for the rocky intertidal and sandy shore monitoring, and maps of these sites are available online. Species were chosen to be monitored if they had certain characteristics, such as ecological importance; are easily recognized, studied and identified in the field by students of various age groups; as well as selected for their sensitivity to disturbance, pollution or environmental change. Data collected becomes baseline information that researchers can follow to determine long-term changes, which has the potential to help resource managers make informed ecosystem management decisions in the future.

Not only will the LiMPETS network provide another set of long-term data that can be used to follow changes, but it will also introduce people of all ages to the rich biota of the National Marine Sanctuaries' ecosystems, and build a group of well-informed, concerned citizens who will watch over these habitats in the future. In addition, students, teachers and communities involved in this program will gain a better idea about how science is carried out, both in the field and when interpreting data.

ACCOMPLISHMENTS

In March 2003, a west coast LiMPETS workshop was held at the Marin Headlands Institute north of San Francisco involving representatives from the five west coast National Marine Sanctuaries, University of California at Santa Cruz and Santa Barbara, Farallones Marine Sanctuary Association, National Marine Sanctuary Program Headquarters, Hawaiian Islands Humpback Whale National Marine Sanctuary and 17 teachers from 12 counties. The teachers were briefed on the background of NOAA's National Marine Sanctuary Program and each of the west coast

LiMPETS PROGRAM GOALS

1. Establish a long-term, quantitative monitoring program of the ocean and coastal ecosystem, that can eventually be used by all 13 National Marine Sanctuaries, other concerned organizations, and the public to assess the health of these habitats.

2. Increase the understanding and appreciation of National Marine Sanctuaries, including various habitats through the direct involvement of high school and middle school teachers, their students, and other volunteer groups.

We hope that this program can be continued in perpetuity by high school students, middle school students and volunteers both to increase public awareness and to provide critical data that can be used to evaluate the health of National Marine Sanctuary habitats and promote wise stewardship.

sites, including a detailed presentation on the research and monitoring activities taking place within the system of marine sanctuaries. The majority of the three-day workshop immersed the teachers into the actual monitoring protocols.

Protocols for three approaches to monitor the rocky intertidal habitat were developed, depending on the sites and species involved: 1) Fixed quadrats along a permanent vertical transect that crosses the intertidal from the top of the high zone through a mussel bed and into the low zone; 2) Random quadrats placed within large fixed plots covering more-or-less uniform areas, usually of mussel beds; 3) Total counts and measurements of selected larger animals within defined areas. Rocky intertidal species lists were reviewed, then teachers used the activities in the classroom field kit to prepare for monitoring. This provided the educators an opportunity to introduce the appropriate techniques and protocols to their students in the classroom before making their way to the monitoring site. Once in the field, teachers worked closely with experienced staff in testing out all three monitoring protocols at Duxbury Reef in Bolinas, California in the Gulf of the Farallones National Marine Sanctuary to refine the techniques demonstrated in the classroom.

On the following day, the teachers went to Crissy Field Beach in the Golden Gate National Recreation Area and plunged into the sandy beach monitoring activities focused on sand crabs. Data collected will provide baseline information about the distribution and density of sand crabs on beaches. Throughout LiMPETS, we will be able to examine fluctuations in the population over a long time period which will greatly help us understand the sand crabs biology and the health of the sandy beaches. We hope to add more species to our sandy beach monitoring in the future, including arrival time and abundance of the jellyfish *Velella velella*, or by-the-wind-sailor, on the beaches.

For sandy beach monitoring, the overall goal is to assess changes in the sandy beach environment that might affect coastal birds and other species that depend on the environment. Workshop participants set up five transect lines perpendicular to the shore and collected ten samples one meter apart along each transect. The gender of each sand crab was determined, and the carapace length measured to the nearest millimeter. Back in the classroom, the data collected were entered into the online database. The results were graphed and analyzed through the website, looking at spatial and seasonal variation, and comparing their beach with other beaches being monitored.

Offshore monitoring in the LiMPETS network currently focuses on

Sandy beach monitoring is hands-on fun for everyone. Claire Johnson/NOAA

Student collected data provides baseline information that in turn will assist resource managers to make informed decisions. Claire Johnson/NOAA

Rocky intertidal monitoring conducted by teachers at Duxbury Reef in the Gulf of the Farallones National Marine Sanctuary. Kathy deWet-Oleson/NOAA

"The most valuable aspect of the LiMPETS network is establishing a system to allow students to use their scientific skills to generate meaningful data in a real world environment."

Paul Blake, Port Angeles School District, Washington

Cordell Bank National Marine Sanctuary. It is an underwater island offshore that sits on a peninsula surrounded by deep water on three sides. Cordell Bank is a granite peak that rises from the soft bottom of the continental shelf to within 37 m of the oceans' surface. The topography and oceanic conditions create a very productive marine environment. Because of the productive environment, Cordell Bank is also a feeding area for many migrant and seasonal pelagic birds from far away, including Sooty Shearwaters and Black-footed Albatrosses.

The offshore activities were done in a classroom setting with the workshop participants. The purpose was to demonstrate other types of monitoring methods, such as investigating migratory movements of pelagic birds and subtidal monitoring with research submersible video. The goals are to introduce students to the less familiar offshore habitat and to show them organisms that exist in these offshore systems. These types of habitats are very different than the nearshore habitats they are used to. While teachers watched footage from an actual research submersible dive on Cordell Bank, the abundance of sea cucumber, sponge, purple hydrocoral and rockfish was measured, and in the soft bottom habitat, the abundance of box crabs, rockfish and ratfish was measured. We hope to add more species to the offshore monitoring in the future as well, and possibly even work with scientists who attach real-time data transmitters on some birds to track their movements across the Pacific during breeding season and have students analyze this data.

In order to gather comparable data among the different sites, habitats and over time, there needs to be consistency in how the different schools participate in the LiMPETS network. We hope that the program will continue to maintain flexibility in how people work in it, while at the same time the program coordinators refine the procedures to a manageable level, maintaining rigorous, scientific protocols. It would be best if data were collected at each rocky intertidal site at least once every spring, and three times for sandy beach habitats.

In addition to schools, volunteer groups could easily participate in the LiMPETS network, adopting sites that their members could take over as their own. With the increase in volunteer programs today involved with hands-on environmental issues, we encourage many groups to become involved with the LiMPETS network and hope to foster new partnerships.

PARTNERING ORGANIZATIONS

Staff from several organizations and the west coast National Marine Sanctuaries have worked together since 2002 to create the LiMPETS network. Partnering organizations are the California Sea Grant Program, Farallones Marine Sanctuary Association, University of California, Santa Cruz, and NOAA's National Marine Sanctuary Program, including Olympic Coast, Cordell Bank, Gulf of the Farallones, Monterey Bay and Channel Islands National Marine Sanctuaries. This publication is a joint effort with staff at all participating organizations.

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INTERESTED IN JOINING?

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